

A revision of *Hemilophia* (Brassicaceae)

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ABSTRACT

Hemilophia (Brassicaceae), a genus of four species endemic to China, is revised. *Hemilophia franchetii* is described from Yunnan Province. The relationship and distinguishing characters of *Hemilophia* are discussed.

MOTS CLÉS

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RÉSUMÉ

Révision du genre *Hemilophia* (Brassicaceae), renfermant quatre espèces endémiques de Chine. Description de *Hemilophia franchetii*, espèce nouvelle de la province de Yunnan. Les affinités et les caractères distinctifs de ce genre sont discutés.

During a visit in 1998 to the Muséum National d'Histoire Naturelle in Paris, I had the chance to examine the type collection of *Hemilophia pulchella* Franchet. It turned out that previous interpretations (e.g., WANG 1987; YING et al. 1993; AL-SHEHBAZ et al. 1999) regarding the identity of this species were erroneous, and the real *H. pulchella* is a species narrowly endemic and poorly collected. On the other hand, what has been known as the widespread *H. pulchella* is an undescribed species hereafter known as *H. franchetii*. It is named in honor of Adrien René FRANCHET (1834–1900), an outstanding French botanist who worked at the Muséum National d'Histoire Naturelle and described numerous Chinese and Japanese genera and species, including *Hemilophia*. These findings prompted the present revision of *Hemilophia*.

FRANCHET (1889) considered *Hemilophia* to be closely related to *Dilophia* Thomson (2 spp., Central Asia, China, Himalaya), but AL-SHEHBAZ et al. (1999) suggested a closer relationship to the monotypic *Dipoma* Franchet (China), and they discussed the characters distinguishing these three genera. SCHULZ (1936) and subsequent authors (e.g., KUAN 1987) placed all three genera in the Lepidieae, a tribe artificially delimited on the presence of angustiseptate fruits, a feature lacking in *Hemilophia* and apparently evolved independently several times within the Brassicaceae (AL-SHEHBAZ 1986). *Hemilophia* strikingly resembles the monotypic *Coelonema* Maximowicz (China) in being rhizomatous perennials with broadly obovate to obcordate petals, prominently dilated median filaments, elliptic to ovate fruits, simple and

forked trichomes, rosulate basal leaves, and subsaccate inner sepals. SCHULZ (1936) placed *Coelonema* in the tribe Drabeae, but further studies are needed to determine the relationship of *Coelonema* to *Hemilophia*. *Hemilophia* is easily distinguished by having appendaged median filaments, fully bracteate racemes, confluent median nectaries, 2-ovuled ovaries, septate fruits, and fruit valves with 3 rows of crests. By contrast, *Coelonema* has unappendaged filaments, basally bracteate racemes, no median nectaries, 8–10-ovuled ovaries, seprate fruits, and smooth uncrested valves.

WANG (1987, 1993) treated *Hemilophia* as monotypic, and recognized the first three species of present account as varieties of *H. pulchella*. However, as shown in the key below, these species are clearly well marked, and treating them as varieties of a single species would clearly obscure the tremendous differences in indumentum, flower color, staminal appendages, flower size, and leaf shape.

HEMILOPHIA Franchet

Pl. Delavay.: 65 (1889).

Herbs rhizomatous perennials. Trichomes simple and pilose to setaceous, or malpighiaceus, sometime minutely forked and crisped. Stems ascending or decumbent, simple or

branched. Basal leaves petiolate, not fleshy, rosulate, soon withering, simple, entire; cauline leaves petiolate or sessile, attenuate, entire. Racemes several-flowered, bracteate throughout, corymbose, elongated considerably or not elongated in fruit. Fruiting pedicels slender, terete, ascending to divaricate, straight or curved. Sepals ovate, oblong, or obovate, ascending, glabrous or pubescent, equal, base of inner pair subsaccate, margin or entire sepal membranous. Petals yellowish, white, pink, or purple, caducous or persistent through fruit maturity, longer than sepals; blade narrowly to broadly obovate or obcordate, apex shallowly to deeply emarginate. Stamens 6, slightly tetradynamous; filaments of lateral stamens filiform, those of median pairs strongly dilated or appendaged basally; anthers ovate, apiculate or not at apex. Nectar glands confluent, subtending bases of all stamens; median nectaries present. Ovules 2 per ovary. Fruit dehiscent silicles, oblong, terete, sessile or subsessile; valves papery, navicular, veinless, glabrous, with 3 rows of crests 1 each on midvein and margins; replum rounded; septum absent; style to 1.5 mm long, cylindric or conical, persistent, glabrous or minutely papillose throughout; stigma capitate, entire. Seeds 1 or 2 per fruit, aseriate, wingless, oblong, plump; seed coat smooth, not mucilaginous when wetted; cotyledons obliquely acuminate.

TYPE.—*Hemilophia pulchella* Franchet.

Key to the species of *Hemilophia*

1. Cauline leaves sessile; sepals membranous throughout, readily caducous at anthesis; petals persistent till fruit dehiscence; style glabrous, conical; stem trichomes exclusively simple; raceme not elongated in fruit 4. *H. sessilifolia*
- 1'. Cauline leaves petiolate; sepals membranous only at margin, remaining until young fruit develops; petals caducous; style minutely papillate, cylindric; stem trichomes crisped simple and forked, or malpighiaceus; raceme elongated considerably in fruit 2
2. Petals purplish; leaf trichomes setose, appressed; sepals not ciliate; stem trichomes malpighiaceus, not crisped 1. *H. franchetii*
- 2'. Petals pink, creamy white or yellowish; leaf glabrous or crisped pilose; sepals ciliate; stem trichomes puberulent, crisped 3
3. Petals 2.5–3.5 mm long, 1.5–2 mm wide, narrowly obovate, pink; base of median filaments slightly dilated, not appendaged, 0.2–0.3 mm wide; leaves glabrous or rarely sparsely pilose; trichomes on inflorescence rachis obsoletely branched 2. *H. pulchella*
- 3'. Petals 5–7 mm long, 3–5 mm wide, obcordate, creamy white to yellowish; base of median filaments conspicuously broadened, appendaged, 0.6–1.1 mm wide; leaves pilose or rarely glabrescent; trichomes of inflorescence rachis minutely branched 3. *H. rockii*

1. *Hemilophia franchetii* Al-Shehbaz, sp. nov.

Hemilophia pulchella var. *pilosa* O.E. Schulz, Repert. Sp. Nov. Regni Veg. 17: 290 (1921).—Type: Schneider 3633, China, Yunnan, near Lichiang, 19 July 1914, 3400 m (lecto- (here designated), B!; isolecto-, GH!, K!, MO!, US!).

Herba rhizomata. Caules (3-)5-10(-15) cm alta, pilis dense malpighiaceis, adpressis, usque ad 0.6 mm longis. Folia caulina petiolata adpressi setosa (setae usque ad 1 mm longae). Petala purpurea, obovata, 3-4(-5) × 2-2.5 mm. Filamenta mediana ad basim inflata 0.5-0.8 mm lata. Stylo papilloso, 0.5-0.9 mm longo. Semina 2-2.3 × 1-1.1 mm.

TYPUS.—Rock 24993, China, Yunnan, alpine meadow of Gussuko, slopes of Mt. Gyina loko, the second peak of Yu-lung Shan, April-May 1932, 13,500 ft. (holo-, MO!; iso-, BM!, E!, GH!, US!).

Stems from rhizomes and sometimes terminate in a basal rosette, producing 3-15 branches (3)5-10(-15) cm tall, pubescent throughout with appressed malpighiaceus trichomes to 0.6 mm long. Basal leaves petiole (3)-5-12 mm long; blade elliptic to ovate or oblanceolate, to 7 × 5 mm long, margin entire, apex obtuse to rounded; cauline leaves petiole 1-4 mm long; blade elliptic to elliptic-ovate or rarely ovate-suborbicular, 3-7 × 2-5 mm, gradually reduced in size upward, sparsely to densely covered with appressed setose trichomes to 1 mm long, margin entire, apex obtuse. Inflorescences elongated considerably in fruit. Sepals oblong, lavender to purplish, not readily caducous, not saccate, 1.5-2 × 0.7-1 mm, with appressed subsetose or non-setose simple trichomes to 0.4 mm long, margin entire, not ciliate, membranous part 0.1-0.2 mm wide. Petals lavender to purple, caducous, obovate, 3-4(-5) × 2-2.5 mm, base cuneate to a claw ca. 1 mm long, apex emarginate. Filaments lavender; lateral filaments 1.2-1.5 mm long; median filaments 1.3-1.6 mm long, inflated basal part 0.5-0.8 mm wide; anthers yellow to lavender, 0.3-0.4 mm long. Fruiting pedicels straight to distinctly curved, divaricate, (3)-5-12(-17) mm long, pubescent with simple trichomes. Fruit valves papery, 2-3 × 1.5-2 mm, with a crest of tubercles surrounding all margin and extending along midvein; gynophore obsolete to 0.2 mm long; style stout cylindric, minutely

papillose throughout, 0.5-0.9 mm long. Seeds 2-2.3 × 1-1.1 mm.

PARATYPES.—CHINA (Yunnan): Ching 30481, Likiang Snow Range (A); Forrest 2570 (BM, E, K); Forrest 5911, E flank of Lichiang Range, 27°20'N (BM, E, K, P, US, W); Handel-Mazzetti 3552, Yülung Shan, near Likiang (W, WU); Rock 4691 (E, GH, NA, S, US, W); Rock 5426, above Mahoang Patze, E slope of Likiang range (E, US); Rock 10413, E slopes of Mount Dyinaloko, northern peak of Likiang Snow range (BM, LE, NY, US); Schneider 2127, near Lichiang (GH, K, US); Yü 15347, Lichiang (A, KUN).

Hemilophia franchetii is endemic to Yunnan, where it grows at 3200-4500 m on limestone gravel, open sand slopes, pine forests on limestone drift, and alpine meadows. It flowers and fruits from April through August.

Because of its purplish small flowers, petiolate leaves, papillose styles, and oblong fruits with three rows of cristae on each fruit valve, *Hemilophia franchetii* has been misidentified as *H. pulchella* ever since SCHULZ's (1921) description of *H. pulchella* var. *pilosa*, which he based on Camilo Schneider's first collection of the species in 1914. Neither SCHULZ nor subsequent workers who dealt with *Hemilophia* had examined the type collection of *H. pulchella* and, therefore, the remarkable differences between *H. franchetii* and *H. pulchella* were overlooked. *Hemilophia franchetii* has stems densely covered with appressed malpighiaceus straight trichomes to 0.6 mm long, leaves with setose trichomes to 1 mm long, nonciliate sepals, obovate petals 3-4(-5) × 2-2.5 mm, and median filaments with inflated basal part 0.5-0.8 mm wide. By contrast, *H. pulchella* has stems with minute, crisped, simple and forked trichomes to 0.06 mm long, leaves glabrous or sparsely pilose with nonsetose trichomes, ciliate sepals, narrowly obovate petals 2.5-3.5 × 1.5-2 mm, and median filaments with dilated, nonappendaged base 0.2-0.3 mm wide.

Hemilophia pulchella var. *pilosa* is based on a collection said to be densely pubescent throughout, as compared to sparsely pubescent plants of what was interpreted as var. *pulchella*. However, variation in the density of indumen-

tum is continuous, and it is impractical to divide the species into infraspecific taxa based on this character alone. The separation by YING et al. (1993) of *H. pulchella* from *H. rockii* on the basis of having glabrous vs. puberulent stems is erroneous, as both species have indumentum along the entire stem.

2. *Hemilophia pulchella* Franchet

Pl. Delavay, : 65 (1889).—Type: *Delavay 2437*, China, Yunnan, ad rupem calcaream, ad basin jugorum nivalium Likiang, 4000 m, 14 Aug. 1886 (holo-, P!; iso-, K!, P[5 sheets!]).

Stems from rhizomes, few to many, 4–15 cm tall, puberulent throughout with minute, crisped, simple and forked trichomes to 0.06 mm long. Basal leaves not seen; cauline leaves petiole 1–3 mm long; blade oblanceolate to narrowly elliptic, 3–6 × 1.5–3 mm, glabrous or rarely sparsely pilose with nonsetose trichomes, margin entire, apex subacute. Inflorescences elongated considerably in fruit. Sepals ovate, greenish, not readily caducous, not saccate, 1–1.5 × 0.7–1 mm, glabrous or sparsely puberulent, margin ciliate with trichomes ca. 0.05 mm long, membranous part to 0.2 mm wide. Petals pink, caducous, narrowly obovate, 2.5–3.5 × 1.5–2 mm, cuneate to a clawlike base, apex shallowly emarginate. Filaments pinkish; lateral filaments 1–1.3 mm long; median filaments 1.2–1.6 mm long, not appendaged, base 0.2–0.3 mm wide; anthers yellow, 0.3–0.4 mm long. Fruiting pedicels straight to slightly curved, divaricate, 3–7 mm long, puberulent with crisped minute trichomes. Immature fruit ca. 2.5 × 1.5 mm, with a crest of tubercles surrounding all margin and extending along midvein; gynophore absent; style stout, cylindric, minutely papillose throughout, to 1 mm long. Seeds not seen.

ADDITIONAL MATERIAL EXAMINED.—CHINA (Yunnan Province): *Forrest 5900*, E flank of Lichiang Range, 27°25'N (RM, E, K); *Handel-Mazzetti 3552*, Yülung Shan, near Likiang (WU); *Rock 9457*, E slope of Likinag Snow Range (US).

Hemilophia pulchella grows at 4000–4700 m on loose limestone gravel, limestone drift and

boulders. It is endemic to SW Yunnan where it flowers from June through August.

The ranges of *Hemilophia franchetii* and *H. pulchella* overlap in parts of Yunnan, as evidenced by the mixed collection *Handel-Mazzetti 3552* (WU). However, no morphological intermediates have been seen in this mixed collection.

Of the six sheets of *Delavay 2437* at P, the one with DELAVAY's hand-written label and FRANCHET's determination and pencilled illustrations is taken here as the holotype.

3. *Hemilophia rockii* O.E. Schulz

Notizbl. Bot. Gart. Berlin-Dahlem 9: 476 (1926).—*H. pulchella* Franchet var. *rockii* (O.E. Schulz) W.T. Wang, Acta Bot. Yunnan. 9: 1 (1987).—Type: *Rock 5552*, China, SW Sichuan, Muli or Mili Kingdom, 3300–3650 m, June 1922 (holo-, B!; iso-, E!, GH!, P!, US!, W!).

Hemilophia pulchella var. *flavida* Hand.-Mazz., Anzeiger Akad. Wiss. Wien, Math. Naturwiss. Kl. 62: 24 (1925).—*H. rockii* O.E. Schulz var. *flavida* (Hand.-Mazz.) Hand.-Mazz., Symbol. Sin. 7: 372 (1931).—Type: *Handel-Mazzetti 7484*, China, SW Sichuan, montis Gonschiga a monasterio Muli ad septentr. Pagi Yünnanensis Yungning versus Dschunglien siti, 4700–4730 m, 6 July 1915 (holo-, WU!; iso-, E!, K!, S!, US!, W!).

Stems from rhizomes and sometimes terminate in a basal rosette, producing few to a cluster of many branches 4–10(–25) cm tall, puberulent throughout with crisped, simple and forked trichomes rarely to 0.2 mm long. Basal leaves dry at anthesis, lanceolate to elliptic-lanceolate, 2–5 × 0.5–1.5 mm, densely pubescent with straight trichomes to 1 mm long; cauline leaves petiole 1–2(–3) mm long; blade oblanceolate to narrowly elliptic or rarely ovate, (2)–4–8(–10) × (1)2–3.5(–5) mm, sparsely covered with crisped simple trichomes to 0.5 mm long, rarely glabrous, margin entire, apex subacute to obtuse. Inflorescences elongated considerably in fruit. Sepals oblong to ovate, greenish, not readily caducous, not saccate, 1.5–2 × 1–1.5 mm, with crisped simple trichomes to 0.4 mm long, margin ciliate with trichomes to 0.1 mm long, membranous part 0.1–0.2 mm wide. Petals yellowish to creamy white, caducous, obcordate, 5–7 × 3–5 mm, base cuneate to a claw ca. 1 mm long,

apex deeply emarginate or nearly 2-lobed. Filaments white; lateral filaments 1.4–1.5(–1.8) mm long; median filaments 1.6–1.8(–2.1) mm long; inflated basal appendage 0.6–1.1 mm; anthers yellow, 0.3–0.4 mm long. Fruiting pedicels straight to slightly curved, divaricate, (3–)4–8(–10) mm long, pubescent with crisped trichomes. Fruit valves papery, 3–4 × 1.5–2.5 mm, with a crest of tubercles surrounding all margin and extending along midvein; gynophore obsolete to 0.2 mm long; style stout cylindric, minutely papillose throughout, 0.8–1.2 mm long. Seeds 2–3 × 1–2 mm.

ADDITIONAL MATERIAL EXAMINED.—CHINA (Sichuan Province): *Handel-Mazzetti* 7273, Montis Sagami supra mosasterium Muli (K, W, WU); *Rock* 16530, Mount Mitzuga, W of Muli Gomba (E, GH, K, NY, US, W); *Rock* 16712, mountains between the Litang and Yalong rivers, Muli Gomba and Baurong and Wa-Erh-Dje (E, F, US); *Kingdon Ward* 4022, Litang river divide, 10 miles S of Muli (E). **Yunnan Province:** *Lan Shubin* 547, Dong Chuan (PE); *Kingdon Ward* 4673, Glacier Lake Camp, 28°5'N, 100°4'S (E).

Hemilophia rockii is restricted to SW Sichuan and adjacent Yunnan, where it grows at 3900–4900 m on loose limestone gravel and scree and flowers in June through July and fruits in July through August.

Variety *flavida* was based solely on having creamy white to yellowish flowers, which is the same as in *Hemilophia rockii*. All other characters of the plant are indistinguishable from those of *H. rockii*, and there seems to be no justification for recognizing this variety.

4. *Hemilophia sessilifolia* Al-Shehbaz, Arai & H. Ohba

Novon 9: 8 (1999).—Type: Wu, Ikeda, Wakabayashi, Miyamoto, Yung & Kikuchi 953, China, Yunnan, Dege, around Daxue Shan, 28°34'N, 99°48'E, 4300–4550 m, 28 Aug. 1996 (holo-, TI!; iso-, MO!).

Stems 1 to several from basal rosette or solitary from rhizomes, 3–9 cm tall, simple or few branched, with spreading to appressed simple tri-

chomes 0.06–0.25 mm long. Basal leaves oblanceolate, 6–10 × 1.5–2.5 mm, dry when plant in flowers, densely with straight simple trichomes 0.8–1.3 mm long; cauline leaves oblong to oblong-ob lanceolate, 2.5–5(–8) × 1–2(–2.5) mm, sessile, entire, obtuse at apex, glabrous or minutely hairy as on stem. Inflorescences not elongated in fruit. Sepals obovate, membranous, early caducous and leaving 4 recepracular teeth, 1.8–2.7 × 1.2–1.5 mm, entire, rounded at apex. Petals persistent to fruit maturity, broadly obovate, 2-lobed, abruptly narrowed to claw, 6–7 × 4–5.5 mm, creamy white with dark green veins, pale to light brown at mouth, apical notch to 2 mm deep; claws 1.5–2.5 mm long. Filaments white; lateral filaments 1.8–2.2 mm long; median filaments 1.9–2.5 mm long, strongly inflated on basal half to an oblong appendage 1.1–1.3 mm long; anthers green. Fruiting pedicels slender, straight, divaricate, 5–6 mm long, pilose. Fruit valves thin papery, 3–4 × 1.5–2 mm, with 3 rows of crests 1 each on midvein margins; gynophore obsolete to 0.1 mm long; style conical, glabrous, 1–1.5 mm long. Seeds 2.5–3 × 1.1–1.3 mm.

ADDITIONAL MATERIAL EXAMINED.—CHINA (Yunnan Province): *Alpine Garden Society Expedition to China* 609, Zhongdian, Wengsu, Da Xue Shan, 28°34'34"N, 99°48'42"E, 4150 m (K, MO).

A very rare species known only from the two collections made at 4150–4550 m on limestone gravel and shale scree.

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